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From Basel I to Basel III

A Cost-Benefit Analysis of the International Regulatory Framework for Banks

Emanuele Bruccini 2380

A Project carried out on the Master in Finance Program, under the supervision of:

Miguel Ferreira

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Abstract

The aim of this paper is to analyze the macroeconomics consequences of Basel III, which will be completely implemented in 2019.

Starting with an analysis of the guidelines of Basel I and Basel II and briefly discussing about the recent Financial Crisis, I focus my attention on Basel III, trying to analyze its impacts.

If the new Regulatory would impact the stability of the financial and bank system, at the same time it can have some negative impacts on the real economy, especially in regards to the operability of the banks.

Keywords: Basel Regulations, Financial Crisis, Basel III, Net Benefits

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Introduction

Banking crises, with their associated economic losses, have been much more frequent than we would like. To increase financial stability, the Basel Committee on Banking Supervision has established stronger capital and liquidity requirements.

The purpose of this paper is to assess the L-T economic impact of the Basel III requirements, once banks have completed the transition to the new requirements. Specifically, the paper wants to analyses and have an answer to the following key questions.

Why Basel III? What is the impact of the Regulation on the economy?

To assess the impact of the Framework on the L-T steady-state level of output, I have mainly relied on some macroeconomic models – DSGE and VECM, using quarterly data over the period 1997 – 2010 and considering two sets of policy scenarios (for capital and for liquidity). To estimate the steady-state economic cost, the following were taken into consideration: the real GDP and real bank lending to private sector, the real S-T interest rate, the lending spread, the average ROE of the considered banks, the average TCE/RWA ratio and NSFR, the Real Estate Price Inflation ratio and the ratio of Current Account balance to nominal GDP.

The benefit is represented by the reduction of the probability of a banking crisis and the associated GDP loss, in addition to the improvement of improving also the stability of the banking sector and of its ability to absorb shocks. The economic costs are represented mainly by the higher lending rates. The "results" of an increase in the capital and liquidity requirement are the welfare loss, measured in terms of consumption, and a loss in steady-state output.

The structure of the paper is as follows. Chapter 1 reviews the existing Regulations (Basel I and Basel II); Chapter 2 is an *excursus* of the Financial Crisis 2007/2008; Chapter 3 goes through Basel III, describing its main pillars; Chapter 4 and 5 present respectively the cost-benefit analysis and the net benefits of the Framework; Chapter 6 summarises and concludes.

1. Basel I and Basel II Regulations

"The Basel Committee on Banking Supervision (BCBS) is the primary global standard-setter for the prudential regulation of banks and provides a forum for cooperation on banking supervisory matters. Its aim is to strengthen the regulation, supervision and practices of banks worldwide with the purpose of enhancing financial stability." (Bank for International Settlements, 2016).

The BCBS was established by the central bank governors of the G-10[1] in 1975 and, even though they are two distinct entities, its Secretariat is located at the BIS in Basel, Switzerland.

1.1 Basel I

The Basel I Accord was the result of several discussions by central bankers from around the world, which consisted of a set of minimum capital requirements for banks in **1988**. It was primarily focused on Credit Risk and Risk-Weighted Assets (RWA).

In order to offset risk, international banks were required to hold capital (classified as Tier 1, Tier 2 and Tier 3 to clarify its strength) equal to 8% of their RWA.

$$Total\ Capital\ Ratio = \frac{Tier\ 1 + Tier\ 2 + Tier\ 3\ Capital}{All\ RWA} \geq 8\%$$

The aims of Basel I were to strengthen the stability of the banking system and to define a uniform framework applicable in all the countries adhered.

The key instrument was represented by the banks' minimum capital requirement, set by considering the organization's credit risk (counterparty risk); each country had also the possibility to consider other risks, such as the interest rate risk and the one related to investments in securities, setting limits even higher.

[1] The G-10 refers to the group of countries that agreed to participate in the General Arrangements to Borrow. It is composed by Belgium, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland (from 1964), the UK and the USA.

As shown in the Figure 1, banks' assets are placed into five categories based on the level of risk and on the nature of the debtor, with risk weights of 0%, 10%, 20%, 50% and 100%.

The *0% risk category* is represented by cash, central bank and government debt and Organization for Economic Cooperation and Development (OECD) government debt.

The *20% category* includes development bank debt, OECD bank debt, OECD securities firm debt, non-OECD bank debt (maturity < 1 year), non-OECD public sector debt and cash.

The *50% category* is composed by residential mortgages.

The *100% category* includes by private sector debt, non-OECD bank debt (maturity > 1 year), real estate, plant and equipment and capital instruments issued at other banks.

Depending on the debtor, public sector debt can be placed in *0%, 10%, 20% or 50% category*.

1.2 Basel II

The Basel II Accord was initially published in **2004**. Basel II, issued by the BCBS, expanded the rules for minimum capital requirements in an attempt to ensure that the capital allocation was more risk[2] sensitive, to intensify the disclosure requirements and to reduce the regulatory arbitrage. It focuses on three main areas, or rather three *pillars*:

1. Minimum Capital Requirements;
2. Supervisory Review Process;
3. Market Discipline.

Unlike Basel I, in order to establish regulatory capital ratios, Basel II incorporates credit risk of assets held by financial institutions, making the risk-assessment more precise and sensitive.

1.2.1 Minimum Capital Requirements

The first pillar focuses on with the regulatory capital calculated for the following three major components of risk: credit risk, operational risk and market risk.

[2] Risks (credit, operational and market) quantified based on data and formal techniques.

- The **credit risk** can be calculated using a series of approaches: the Standardized Approach (directed to "small banks"), the Foundation and Advanced Internal Rating-Based (IRB) Approaches (designed to "large banks") and the General IB2 Restriction.
- For **operational risk**, there are three different approaches: Basic Indicator Approach (BIA), Standardized Approach (TSA) and Internal Measurement Approach.
- For **market risk** the main approach is Value at Risk (VaR).

Basel II confirms and does not alter in any way the Total Capital Ratio of 8% minimum, but refines the RWA (calculated as the sum of assets multiplied by their risk weights) and divides the regulatory capital of a bank into 3 tiers, with the effect that the higher the tier, the less subordinated securities a bank can include in it.

RWA is proposed to *penalize* banks for holding risky assets; it increases RWA and lowers capital ratios. The riskier the asset, the higher its weight.

Tier 1 capital is the core measure of a bank's financial strength; it includes common stocks, disclosed reserves (or retained earnings) and non-redeemable non-cumulative preferred stocks. Tier 1 capital should be $\geq$ 4% of RWA.

Tier 2 capital represents "supplementary capital" such as undisclosed reserves, revaluation reserves, general loan-loss reserves[3], subordinated debt and hybrid (debt/equity) instruments. Tier 2 is limited to 100% of Tier 1 capital.

Tier 3 consists of Tier 2 plus short-term subordinated loans.

Larger banks are also able to plan and implement an internal rating methodology, according to which the minimum capital is calculated based on four elements: Probability of Defaults, Loss Given Default, Exposure at Default and Maturity.

[3] General loan-loss reserves are subject to a limit of 1.25% of RWA to the extent a bank uses the standardized approach and to a limit of 0.6% of credit RWA to the extent a bank uses the IRB approach.

1.2.2 Supervisory Review Process

The Supervisory Review Process, based on the below four principles presented below, provides the framework for national regulators to deal with systemic, strategic, reputational, liquidity and legal risks:

1. Banks should have a designated process for assessing their overall capital adequacy in relation to their risk profile and to a strategy for maintaining their capital levels.
2. Supervisors should review and evaluate banks' internal capital adequacy assessments and strategies and take appropriate action if the results are not satisfying.
3. Supervisors should expect banks to operate above the minimum regulatory capital ratios and should require banks to hold capital more than the minimum.
4. Supervisors should intervene at an early stage to prevent capital from falling below the minimum levels and should require rapid action if capital is not maintained / restored.

1.2.3 Market Discipline

The third pillar has the objective to further attune and improve enhance the minimum capital requirements and supervisory review process by developing a set of requirements for banks' risk exposures, risk assessment processes and capital adequacy.

2. The Financial Crisis of 2007/2008

The Financial Crisis of 2007/2008 showed that the bank capital was, in general, too low. Empirical evidence and academic studies established that in order to prevent similar shocks, the bank capital needed to be higher. The Crisis can be analyzed considering two main aspects: the subprime mortgages and the shadow banking phenomenon.

2.1 Subprime mortgages

In the years before the crisis there was a high flood of mortgage lending in the United States; loans were granted to subprime borrowers with weak credit histories who, in most of the cases, were not able to repay them. Putting large numbers of them together in pools, financial engineers transformed them into "supposedly low-risk securities"; the pooled mortgages were used to back securities known as collateralised debt obligations (CDOs).

In a world of low interest rates, CDOs were appealing because they appeared to be relatively safe with high returns.

When America's housing market turned, pooling and other financial engineering did not protect investors and the value of mortgage-backed securities dropped.

Trust began to dissolve in 2007. The collapse of Lehman Brothers in September 2008 was the cause of the almost-collapse of the world's financial system.

2.2 Shadow Banking Phenomenon

When America's housing market turned in 2007/08, a chain reaction exposed fragilities in the financial system through the so-called *Shadow Banking Phenomenon*. It describes risky off-balance-sheet vehicles to sell loans repackaged as bonds.

Shadow banks operate by raising the short-term funds to buy assets with longer-term maturities. Problems arose when investors became dubious in regard to the value of those assets and many of them decided to withdraw their funds at once; to repay those investors, shadow banks had to sell assets. The result of these "fire sales" was the reduction of the value of those longer-term assets.

To conclude, shadow banks were characterized by a lack of information and transparency about the value of the assets, shadow governance and ownership structures, little regulatory control and a lack of access to liquidity support to prevent fire sales.

3. Basel III

Even before Lehman Brothers collapse in September 2008, the need for a strengthening of the framework was apparent. The weaknesses in the banking sector were transmitted to the whole of the financial system and subsequently to the real economy, with a massive contraction of liquidity and credit availability.

The final text of Basel III was proposed for the first time in **2010** and it will be completely implemented in **2019**. Please see the Figure 2 in Appendix for the roadmap. The aim of Basel III is mainly to strengthen the banking system and the transparency and to thus improve risk management, governance and the ability to absorb shocks. The Regulatory introduced some micro-prudential and macro-prudential reforms:

- Bank-level, or micro-prudential, regulations to help raise the resilience of banks to periods of stress;
- Macro-prudential regulations to reduce the risk of system wide shocks, promoting the accumulation of capital buffers in good times to be drawn down in periods of stress.

The channels through which the new rules enacted by the BCBS – the so-called Basel III Standards – would impact the real economy are the *Capital and Leverage ratios*, the *Liquidity Coverage Ratio (LCR)* and the *Net Stable Funding Ratio (NSFR)*.

3.1 Capital Rules

It is important to have the banks' risk exposures are financed by a high-quality capital base. The Committee introduced a leverage ratio requirement to constrain leverage in the banking

sector and to introduce more precautions against model risk and measurement error. According to the quantitative impact study conducted by the Basel Committee, on average the newly-defined capital ratio (Common Equity Tier 1 ratio) of large banks decreases from 11.1% to 5.7%, due to the change of definition of capital and the changes in RWAs.

3.1.1 Definition of Capital

Total regulatory capital consists of the sum of Tier 1 (going-concern capital) - Common Equity Tier 1 and Additional Tier 1 – and Tier 2 (gone-concern capital), subject to the restrictions presented in Figure 3 of the Appendix.

3.1.1.1 Common Equity Tier 1 and Additional Tier 1 capital

Common Equity Tier 1[4] (CET1) capital consists of the sum of the following elements:

- Common shares issued by the bank;
- Stock surplus (share premium);
- Retained earnings (including interim profit or loss);
- Accumulated other comprehensive income (including interim profit or loss) and other disclosed reserves;
- Minority interests;
- Regulatory adjustments[5] applied in the calculation of CET1.

Additional Tier 1 capital consists of the sum of the following elements:

- Instruments issued by the bank (not included in CET1);
- Stock surplus (share premium);
- Minority interests that are not included in CET1;
- Regulatory adjustments applied in the calculation of Additional Tier 1 Capital.

[4] Dividends are removed in accordance with applicable accounting standards.
[5] These adjustments include goodwill and other intangibles, deferred tax assets, cash flow hedge reserve, gain on sale transactions, investments in own shares and in the capital of financial entities outside the scope of regulatory consolidation.

3.1.1.2 Tier 2 capital

Tier 2 capital consists of the sum of the following elements:

- Instruments issued by the bank (and are not included in Tier 1 capital);
- Stock surplus (share premium);
- Minority interest that are not included in Tier 1 capital;
- Certain loan loss provisions;
- Regulatory adjustments applied in the calculation of Tier 2 Capital.

3.1.1.3 Transitional Arrangements

The transitional arrangements aim at ensuring that the banks are able to meet the higher capital standards still supporting lending to the economy. These arrangements include:

- Member countries had to translate the rules into national laws before 1 January 2013. Furthermore, banks have been required to meet the following minimum requirements:
    - 3.5% CET1/RWAs;
    - 4.5% Tier 1 capital/RWAs;
    - 8.0% total capital/RWAs.
- The min CET1 and Tier 1 requirements have been phased in between Jan. 2013 and Jan. 2015; the regulatory adjustments will be deducted from CET1 by Jan. 2018.
- From 1 January 2013, the eligible capital issued out of subsidiaries and held by third parties should also be phased in. In case it is not eligible, 20% of this amount should be excluded from the relevant component of capital on January 2014, 40% on January 2015, 60% on January 2016, 80% on January 2017, and reach 100% on January 2018.
- Existing public sector capital injections will be exempted until January 2018.

3.1.2 Risk Coverage

To better address counterparty credit risk, credit valuation adjustments and wrong-way risk, banks use a series of revised metrics (such as the Effective EPE[6] and the CVA). They are obliged to use current market data and a stress calibration and the greater of the portfolio-level capital charge based on Effective EPE.

In addition, a bank must cover the risk of mark-to-market losses (credit value adjustments, CVA) on the expected counterparty risk.

$$CVA = (LGD_{Mkt}) * \sum_{i=1}^{T} \max\left(0; \exp\left(-\frac{s_{i-1} * t_{i-1}}{LGD_{Mkt}}\right) - \exp\left(-\frac{s_i * t_i}{LGD_{Mkt}}\right)\right) * \left(\frac{EE_{i-1} * D_{i-1} + EE_i * D_i}{2}\right)$$

where:

- LGD_{Mkt} is the loss given default of the counterparty;
- The first factor represents an estimate of the risk neutral probability of default occurring between t_{i-1} and t_i;
- s_i is the credit spread of the counterparty in t_i. It must be used if the counterparty CDS spread is available; in the opposite case, it should be used a proxy;
- EE_i is the expected exposure to the counterparty at revaluation time t_i;
- D_i is the default risk-free discount factor at time t_i, where $D_0 = 1$.

3.1.3 Capital Conservation Buffer

The capital conservation buffer, fully effective in 2019, aims to ensure that banks accumulate capital buffers outside periods of stress, above the regulatory minimum, to be able to drawn down in case losses are incurred. When buffers have been drawn down, banks should rebuild them raising new capital from the private sector or reducing distributions of earnings.

[6] The Effective EPE is the weighted average over time of the expected exposure; the weights are the proportion that an individual expected exposure represents of the entire exposure horizon time interval. $\boldsymbol{EPE\,(t) = \frac{1}{t_E}\int_0^{t_E} EE\,(t_E)dt}$

The Figure 4 in Appendix shows all the details regarding the minimum capital conservation ratios a bank must meet.

3.1.4 Leverage Ratio

The Committee agreed to introduce a non-risk based leverage ratio. Based on the capital and total exposure, the basis of calculation is the average of the monthly leverage ratio over the quarter.

Items completely deducted from capital do not contribute to leverage and should therefore be also deducted also from the measure of exposure. Derivatives create two types of exposure: one reflecting the fair value of the contract and a notional one that represents the underlying interest of the contract.

The transition period for the leverage ratio started on 2011; it includes a monitoring period (from January 2011) and a run period (from January 2013 to January 2017). Based on the results of the run period, any adjustments will be carried out in the first half of 2017.

3.2 Liquidity Coverage Ratio

The LCR promotes the short-term elasticity of a bank's liquidity risk profile, ensuring that a bank has an adequate stock of high-quality liquid assets (HQLA), which can be easily converted into cash. During a period of stress, banks would be expected to use their pool of liquid assets, even if it would cause a temporary fall below the threshold.

To ensure that the LCR can be introduced without disruption to the banking systems or the economic activity, it follows a gradual approach: 60% on 2015, 70% on 2016, 80% on 2017, 90% on 2018 and 100% on 2019.

The LCR has two components: the value of the stock of HQLA[7] and the total net cash outflows[8].

$$\frac{Stock\ of\ HQLA}{Total\ Net\ Cash\ Outflows\ over\ the\ next\ 30\ calendar\ days} \geq 100\%$$

HQLA are comprised of Level 1 (cash, central bank reserves and marketable securities backed by sovereigns and central banks) and Level 2 (2A: some government securities, covered bonds and corporate debt securities and 2B: lower rated corporate bonds and residential mortgage backed securities) assets. Level 1 assets are the highest quality and very liquid, and there is no limit on the quantity a bank can hold to meet the LCR; level 2 assets may not in aggregate account for more than 40% of a bank's HQLA.

3.3 Net Stable Funding Ratio

The NSFR, that will become a minimum standard by January 2018, requires banks to keep a stable funding profile in regard to their assets and off-balance sheet activities, in an attempt at reducing the likelihood that breaks to a regular source of funding will consume its liquidity position, thus increasing the risk of failure and potentially leading to systemic stress.

The NSFR can be defined as the amount of Available Stable Funding (ASF)[9] relative to the amount of Required Stable Funding[10]; it should be equal to at least 100% on an ongoing basis.

$$\frac{Available\ Stable\ Funding}{Required\ Stable\ Funding} \geq 100\%$$

[7] HQLA are characterized by quality, low risk, ease and certainty of valuation, low correlation with risky assets and should be listed on a developed, recognised, active and sizable market.
[8] It is defined as total expected cash outflows, minus total expected cash inflows, in the specified stress scenario for the subsequent 30 calendar days. Total cash inflows are subject to an aggregate cap of 75% of total expected cash outflows, always ensuring a minimum level of HQLA holdings.
[9] Portion of capital and liabilities expected to be reliable over the time horizon considered by the NSFR, which extends to one year.
[10] Function of the liquidity characteristics and residual maturities of the various assets held by that institution as well as those of its off-balance sheet exposures.

The amount of **ASF** is measured based on the stability of an institution's funding sources. It is calculated by first assigning the carrying value of an institution's capital and liabilities to one of the categories as presented in Figure 5 in Appendix and then multiplying the total amount by an ASF factor; the total ASF is the sum of the weighted amounts.

The amount of **RSF** is measured based on the liquidity risk profile of an institution's assets and off-balance sheet exposures. It is calculated by first assigning the carrying value of an institution's assets to one of the categories listed in the Figure 6 in Appendix, based on their residual maturity or liquidity value, and then multiplying the total amount by its RSF factor; the RSF is the sum of the weighted amounts added to the amount of off-balance sheets activity multiplied by its RSF factor.

4. A Cost-Benefit Analysis of Basel III: Benefits and Costs

Basel III will strengthen banking systems and stabilize financial markets, but it will also have some negative impacts. Even if higher bank capital requirements have several benefits from a financial stability perspective, they can also be the cause of a series of costs falling on banks and society: increasing banks' funding costs, customers' borrowing costs rise and investments and stocks of capital fall, thereby reducing the long-term level of GDP.

Subsequently, tighter liquidity standards will lead to a reduction of banks' profitability, which they will partly compensate by increasing the interest rate on loans and/or decreasing the remuneration on deposits.

For the capital base, since Tangible Common Equity (TCE) is the highest quality component of bank capital, it may be useful to focus on the ratio of TCE to RWAs:

$$\frac{TCE}{RWA} = \frac{Common\ Equity - Intangibles - Goodwill}{Risk\ Weighted\ Assets}$$

Keeping all other variables equal, an increase of liquid assets leads to a decline of RWAs and an increase of the ratio, helping banks to meet the tighter capital requirements and a higher liquidity ratio.

Quarterly data[11] over the period 1997:Q1 to 2010:Q2 were taken into consideration the present study. To estimate the steady-state economic cost, the following were considered: the real GDP and real bank lending (L) to private sector, the real short term interest rate (i - π) (as given by the 3-month interbank rate - CPI inflation), the lending spread (r - i) (as given by the 3-month clearing banks' lending rate - the 3-month interbank rate), the average ROE of the considered banks[12], the average TCE/RWA ratio, the average NSFR, the Real Estate Price Inflation ratio (RPI)[13] and the ratio of Current Account balance to nominal GDP (CA)[14].
By checking EU banks' historical balance sheets and income statements, an approximated NSFR can be calculated as below:

$$NSFR = \frac{ASF}{RSF} \approx \frac{Equity + Debt_{\geq 1y} + Liabilities_{\geq 1y} + 85\%StableDep_{<1y} + 70\%OtherDep_{<1y}}{5\%GovtDebt\ + 50\%CorpLoans_{<1y} + 85\%RetLoans_{<1y} + OtherAssets}$$

The denominator reflects the RSF, with a factor applied based on their expected liquidation value under stressed circumstances.[15]. Since the portfolio structure of bank's asset holdings is unknown, I applied a 50% discount factor to all less than 1 year Debt Securities.

[11] The bank data were collected from Bankscope and banks' annual reports. The macroeconomic data were collected from the International Financial Statistics (IFS) database.
[12] Barclays Bank, HSBC Bank, Lloyds Bank, Royal Bank of Scotland, Santander, Standard Chartered Bank.
[13] It is a great source for estimation predictive power; a higher RPI would increase the probability of crisis.
[14] Historically, a banking crisis usually coincides with a currency crisis.
[15] Cash, securities with maturity < 1 year to maturity and interbank loans do not have to be funded and have a factor of 0%. Government debt is considered very liquid and is funded at 5% of face value. Corporate loans and retail loans that mature within 1 year are funded 50% and 85%, respectively, assuming they are not rolled over when they mature.

4.1 Economic Benefits

The Basel III reforms are expected to enhance and increase financial stability by strengthening the quality of banks' capital and funding structures (increasing the TCE/RWA ratio), with liquidity having an important role in prevent crises and economic downturns.

Higher capital requirements can promote bank efficiency, through cost reductions or discouraging banks from seizing excessive market share. The capital can be seen as a lifeline: it absorbs losses and reduces the probability of a failure.

Averaging across countries[16], historically banking crises occur every 20-25 years; according to Stefan Walter, "the annual probability of a crisis is 4-5% in both industrial and emerging markets countries". Figure 7 shows an overview of the banking crises in BCBS member countries since 1985.

In a banking crisis, two types of GDP loss might occur: a temporary one, since it may regain its pre-crisis level and a permanent one, because of a permanently lower GDP growth trend. Figure 8 shows some example of the evolution of the GDP per capita before and after each banking crisis.

The crisis period can be expressed as the time from the cyclical peak to the time that the GDP growth rate recovers to its pre-crisis level.

The benefit of the new requirements is measured as the reduction in the probability of a crisis multiplied by the expected loss[17] arising from a financial crisis:

$$Benefit = \Delta Pr * expected\ loss\ from\ a\ financial\ crisis$$

$$Pr_t = \Phi(\alpha_i\ \mathrm{TCE}/RWA_t * NSFR_t + \beta_i Z_{it})$$

[16] The countries took into consideration are: Australia, Canada, France, Germany, Italy, Japan, Korea, Mexico, the Netherlands, Spain, Switzerland, the United Kingdom and the United States.

[17] Computed as the discounted present value of the cumulative loss, using a conservative discount factor.

$$Expected\ loss\ from\ a\ financial\ crisis = \frac{\delta}{(1-\alpha)}$$

where Z_t represents a vector of macroeconomic variables (including RPI_t and CA_t), δ the permanent loss and α the discount factor.

The average historical TCE/RWA (or NSFR) of total capital and reserves to total assets for the 14 largest OECD countries from 1980 to 2008 is 6% (or 0.95).

Holding other factors constant, a 1% (12%) increase in the TCE/RWA ratio reduces the probability of a crisis by around 3.211% (5%). If the NSFR ratio remains at 1, the reduction in the probability of a crisis will be 2.036%. Please refer to Figure 9 for more details.

To summarise, we can state that an increase in the capital and liquidity levels leads to a reduction in the probability of crises, as well as the better the system is capitalized, the more decline the incremental benefits of the requirements. Furthermore,

- if the TCE/RWA ratio is 7% - 12%, the temporary and permanent expected benefits will range respectively between 1.102% - 1.714% and 23.136% - 35.997%;
- if the NSFR is 1, the temporary and permanent expected benefits will be respectively 0.699% and 14.670%.

4.2 Economic Costs

Even if there is uncertainty regarding the impacts on the economic growth due, on one side, to the degree of activism of the monetary policy[18] and, on the other side, to the difficulty to convert the Reform into inputs, it is assumed that all the cost of meeting the NSFR is recovered by raising lending spreads and that the costs of debt are not affected.

In general, a small increase in the capital ratio leads to an increase in the lending spread; higher lending rates reduce investments and output levels (decreasing income and/or raising

[18] Even if over the long run monetary policy is assumed to be neutral.

expenses), thereby reducing the long-run level of GDP. Banks can adopt several reactions to this reduction, such as the issue of new equity and the increase of retained earnings.

The present study is based mainly on the impact of the new rules on interest rate spreads. As shown in Figure 10, the spreads remained very low during the timeframe of 1997-2007; however, a signal of the imminent financial instability was given by the fact that in 2007 the lending spreads were at a 10-year high.

Another important factor taken into consideration is the **welfare**[19]; it considers additional important aspects (e.g., a small loss in steady-state output could reflect a large increase in hours worked, offset by a fall in consumption).

Using the *Van den Heuvel* formula, the welfare-equivalent permanent loss in consumption caused by the regulatory tightening was calculated; it expresses the welfare cost of raising the capital requirement by $\Delta\bar{v}$:

$$Cost = \frac{D}{C}\left(R^E - R^d - g_D\right)\frac{\Delta\bar{v}}{(1-\bar{v})} = \frac{D}{C}\left(\frac{R^L - R^d - \frac{g}{L}}{\bar{v}}\right)\frac{\Delta\bar{v}}{(1-\bar{v})}$$

where:

- D: total deposits;
- C: aggregate consumption;
- g_D: share in the net non-interest cost to attracting and servicing deposits ($0 \leq g_D \leq \frac{g}{D}$);
- R^E: risk-adjusted return on equity;
- R^d: average interest rate on total deposits;
- R^L: net average return on total assets for the banking system;
- L: total assets of the banking system.

[19] Attention is restricted to Canada, France, Germany, Italy, the Netherlands, Spain and the United States.

To assess the impact of the Framework on the long-term steady-state level of output, I have mainly relied on some macroeconomic models – the Dynamic Stochastic General Equilibrium Models (DSGE) and the Vector Error-Correction Models (VECM). Two sets of policy scenarios have been considered, for capital and for liquidity, respectively; it was assumed that the capital tightening could be proxied by a 2, 4 or 6% increase in the TCE/RWA ratio. Regarding the liquidity, was considered a 25 or 50% increase: if banks increase liquid assets to reach a higher liquidity ratio, other things being equal, RWA decline and the TCE/RWA ratio increases.

If the capital requirement increases, the steady state output is expected to decline: a 1% increase in the capital requirement corresponds to a 0.09% median loss in steady-state output.

$$Median\ loss = \frac{1}{3}\left(\frac{0.20}{2} + \frac{0.33}{4} + \frac{0.50}{6}\right) = 0.09$$

The higher liquidity requirements lead to an extra decline in the level of output (lines 4-9). This effect can be read as the difference between the "capital only" (lines 1-3) and the "capital and liquidity" scenarios (lines 4–9). Please refer to Figure 11 for all the detailed information.

To summarize, the "results" of an increase in the capital and liquidity requirements are the welfare loss, in terms of consumption, a loss in the steady-state output and a decline in the output variability; tighter capital rules induce a decline in output volatility and the higher liquidity requirements lead to a reduction of the standard deviation of output[20].

5. Conclusions – The Net Benefit of Basel III

Starting with an analysis of the milestones of Basel I and Basel II and a brief discussion about the recent Financial Crisis, this paper focuses its attention on Basel III and, in particular, on the long-term impact of the changes introduced.

[20] This is sensitive to some factors, such as the type of shocks hitting the economy and the monetary policy rule.

The changes introduced by Basel III will be able to improve institutional settings (in regulation, supervision and governance) and, through prudential and macro-prudential regulations, to avoid migration to less regulated financial markets. Banks will be "obliged" to maintain a big portion of their credit exposures to governments[21], which will have a privileged position in financial markets (with access to cheap credit).

Higher capital and liquidity reduce the annual probability of banking crises, but the costs of the crisis have long-lasting effects on output.

In the long-term, the economic benefits exceeds the economic costs; as higher capital requirements reduce the probability of a crisis and costs are not limited to a year, the more permanent the effects, the larger the annual benefit.

In the short-term, the extent of the economic cost depends on the assumptions, the length of the implementation period and the country considered.

Using the median estimate of the cost of a crisis, each 1% reduction in the annual probability of a crisis yields a benefit of 0.6% of GDP per year; because of the uncertainty, a 1% increase of the capital ratio cut the probability of crisis from 4.6% to 2.3% (with a benefit of 1.4% of GDP) and yields to a 0.13% increase in the lending spread (with a loss of 0.09% of GDP), with a positive net benefit in the long-term.

In summary, I expect that Basel III will generate a significant positive net benefit for the economy, with a clear role for liquidity to prevent banking crises and economic downturns. The Reform, in fact, strengthening the quality of both banks' capital bases and funding structures is likely to increase financial stability.

[21] The liquidity will be concentrated mostly in government securities.

Appendix

Figure 1 – Based on level of risk and on the nature of the debtor, bank's assets categories

0%	10%	20%	50%	100%
Cash OECD Government Debt Government Debt Central Bank Debt Public Sector Debt	Public Sector Debt	Development Bank Debt non-OECD Bank Debt OECD Securities Firm Debt OECD Bank Debt non-OECD Public Sector Debt Cash in Collection	Residential Mortgages Public Sector Debt	Private Sector Debt non-OECD Bank Debt Real Estate, Plant and Equipment Capital Instruments Issued at Other Banks

Figure 2 – Roadmap of Basel III

	Phases	2013	2014	2015	2016	2017	2018	2019
Capital	Leverage Ratio		Parallel run 1 Jan 2013 – 1 Jan 2017 Disclosure starts 1 Jan 2015				Migration to Pillar 1	
	Minimum Common Equity Capital Ratio	3.5%	4.0%	4.5%				**4.5%**
	Capital Conservation Buffer				0.625%	1.25%	1.875%	**2.5%**
	Minimum common equity plus capital conservation buffer	3.5%	4.0%	4.5%	5.125%	5.75%	6.375%	**7.0%**
	Phase-in of deductions from CET1*		20%	40%	60%	80%	100%	**100%**
	Minimum Tier 1 Capital	4.5%	5.5%	6.0%				**6.0%**
	Minimum Total Capital		8.0%					**8.0%**
	Minimum Total Capital plus conservation buffer		8.0%		8.625%	9.25%	9.875%	**10.5%**
	Capital instruments that no longer qualify as non-core Tier 1 capital or Tier 2 capital		Phased out over 10 year horizon beginning 2013					
Liquidity	Liquidity coverage ratio – minimum requirement			60%	70%	80%	90%	**100%**
	Net stable funding ratio						Introduce minimum standard	

Figure 3 - Calibration of the Capital Framework, Capital requirements and buffers

Calibration of the Capital Framework			
Capital requirements and buffers (all numbers are in %)			
	Common Equity Tier 1	**Tier 1 Capital**	**Total Capital**
Minimum	4.5	6.0	8.0
Conservation Buffer	2.5		
Minimum + Conservation Buffer	7.0	8.5	10.5
Countercyclical Buffer	0.0 - 2.5		

Figure 4 – Individual Bank Minimum Capital Conservation Standard

Individual Bank min Capital Conservation Standards	
Common Equity Tier 1 Ratio	*Min Capital Conservation Ratio*
4.5% - 5.125%	100%
5.125% - 5.75%	80%
5.75% - 6.375%	60%
6.375% - 7.0%	40%
> 7%	0%

Figure 5 - Summary of liability categories and associated ASF factors

ASF factor	Components of ASF category
100%	• Total regulatory capital (excluding Tier 2 instruments with residual maturity of less than one year) • Other capital instruments and liabilities with effective residual maturity of one year or more
95%	• Stable non-maturity (demand) deposits and term deposits with residual maturity of less than one year provided by retail and small business customers
90%	• Less stable non-maturity deposits and term deposits with residual maturity of less than one year provided by retail and small business customers
50%	• Funding with residual maturity of less than one year provided by non-financial corporate customers • Operational deposits • Funding with residual maturity of less than one year from sovereigns, PSEs, and multilateral and national development banks • Other funding with residual maturity between six months and less than one year not included in the above categories, including funding provided by central banks and financial institutions
0%	• All other liabilities and equity not included in the above categories, including liabilities without a stated maturity (with a specific treatment for deferred tax liabilities and minority interests) • NSFR derivative liabilities net of NSFR derivative assets if NSFR derivative liabilities are greater than NSFR derivative assets • "Trade date" payables arising from purchases of financial instruments, foreign currencies and commodities

Figure 6 - Summary of asset categories and associated RSF factors

RSF factor	Components of RSF category
0%	• Coins and banknotes • All central bank reserves • All claims on central banks with residual maturities of less than six months • "Trade date" receivables arising from sales of financial instruments, foreign currencies and commodities.
5%	• Unencumbered Level 1 assets, excluding coins, banknotes and central bank reserves
10%	• Unencumbered loans to financial institutions with residual maturities of less than six months, where the loan is secured against Level 1 assets as defined in LCR paragraph 50, and where the bank has the ability to freely rehypothecate the received collateral for the life of the loan
15%	• All other unencumbered loans to financial institutions with residual maturities of less than six months not included in the above categories • Unencumbered Level 2A assets
50%	• Unencumbered Level 2B assets • HQLA encumbered for a period of six months or more and less than one year • Loans to financial institutions and central banks with residual maturities between six months and less than one year • Deposits held at other financial institutions for operational purposes • All other assets not included in the above categories with residual maturity of less than one year, including loans to non-financial corporate clients, loans to retail and small business customers, and loans to sovereigns and PSEs
65%	• Unencumbered residential mortgages with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the Standardised Approach • Other unencumbered loans not included in the above categories, excluding loans to financial institutions, with a residual maturity of one year or more and with a risk weight of less than or equal to 35% under the standardised approach
85%	• Cash, securities or other assets posted as initial margin for derivative contracts and cash or other assets provided to contribute to the default fund of a CCP • Other unencumbered performing loans with risk weights greater than 35% under the standardised approach and residual maturities of one year or more, excluding loans to financial institutions • Unencumbered securities that are not in default and do not qualify as HQLA with a remaining maturity of one year or more and exchange-traded equities • Physical traded commodities, including gold
100%	• All assets that are encumbered for a period of one year or more • NSFR derivative assets net of NSFR derivative liabilities if NSFR derivative assets are greater than NSFR derivative liabilities • 20% of derivative liabilities as calculated according to paragraph 19 • All other assets not included in the above categories, including non-performing loans, loans to financial institutions with a residual maturity of one year or more, non-exchange-traded equities, fixed assets, items deducted from regulatory capital, retained interest, insurance assets, subsidiary interests and defaulted securities

Figure 7 – Banking Crises in BCBS since 1985

	Reinhart and Rogoff (2008)	Laeven and Valencia (2008)
Argentina	1989, 1994, 2001	1989, 1995, 2001
Australia	1989	
Belgium	2008	2008
Brazil	1990, 1994	1990, 1994
Canada		
China	1997	1998
France	1994, 2008	2008
Germany	2007	2007
Hong Kong	1998	
India	1993	1993
Indonesia	1992, 1997	1997
Italy	1990	
Japan	1992, 2008	1997, 2008
Korea	1986, 1997	1997
Luxemburg	2008	2008
Mexico	1992	1994
Netherlands	2008	2008
Russia	1995, 1998	1998
Saudi Arabia		
South Africa	1989	
Sweden	1991	1991
Switzerland	2008	2008
Turkey	1991, 2000	2000
United Kingdom	1991, 1995, 2007	2007
United States	2007	1988, 2007

Figure 8 – Output around banking crises

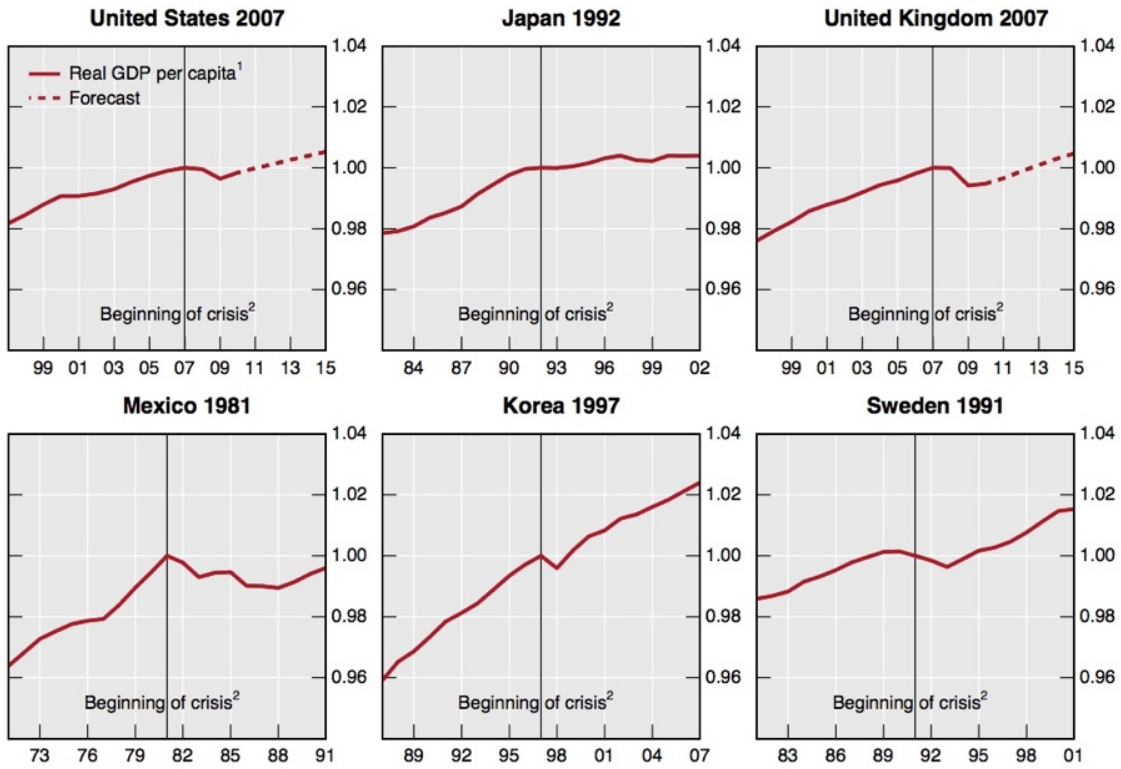

Figure 9 - The relationships between TCE/RWA (or NSFR) and changes in the probability of a banking crisis, reduction in output and temporary/permanent benefit

TCE/RWA	Reduction in the Prob of a Crisis (%)	NSFR	Reduction in the Prob of a Crisis (%)
7%	3.211	0.96	0.612
8%	4.634	0.97	1.020
9%	4.930	0.98	1.389
10%	4.984	0.99	1.727
11%	4.993	1	2.036
12%	4.996		
13%	4.996		
14%	4.996		
15%	4.996		

TCE/RWA	Reduction in Output (%)	NSFR	Reduction in Output (%)
7%	0.238	0.96	0.318
8%	0.318	0.97	0.327
9%	0.377	0.98	0.336
10%	0.426	0.99	0.344
11%	0.468	1	0.352
12%	0.505		
13%	0.539		
14%	0.570		
15%	0.598		

TCE/RWA	Temporary Exp Benefit (%)	Permanent Exp Benefit (%)
7%	1.102	23.136
8%	1.59	33.389
9%	1.691	35.521
10%	1.710	35.910
11%	1.713	35.975
12%	1.714	35.997
13%	1.714	35.997
14%	1.714	35.997
15%	1.714	35.997

NSFR	Temporary Exp Benefit (%)	Permanent Exp Benefit (%)
0.96	0.210	4.410
0.97	0.350	7.349
0.98	0.477	10.008
0.99	0.593	12.443
1	0.699	14.670

Figure 10 – Short term real interest rates and lending spreads, 1997-2007

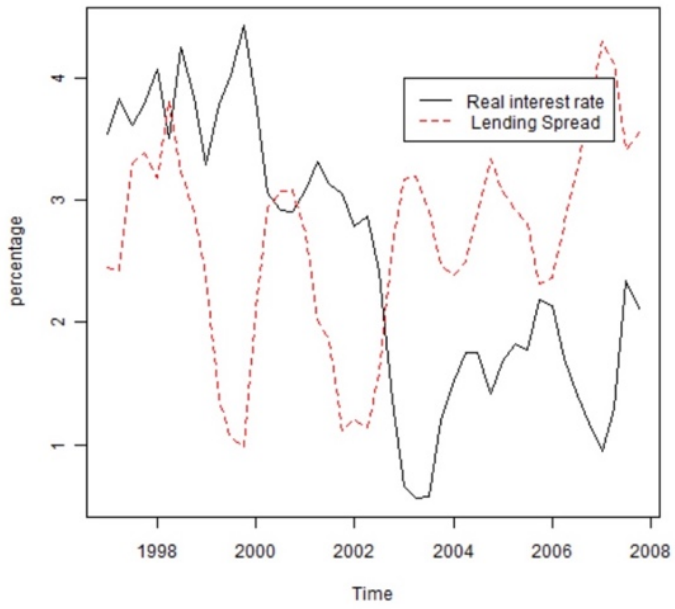

Figure 11 – Steady state output loss due to regulatory tightening

Increase in TCE/RW A ratio relative to current level (% points)	Target liquidity tightening, relative to current level (% increase)	Euro area, DSGE models		Italy, UK	Average	Std. Dev.	Min	Max	Median
		with bank capital	without bank capital	Semi structural models, without bank capital					
% points	*% increase*	*% deviation*							
2	0	0.29	0.24	0.29	0.25	0.20	0.04	0.70	0.20
4	0	0.53	0.49	0.58	0.47	0.35	0.07	1.10	0.33
6	0	0.81	0.72	0.84	0.68	0.50	0.07	1.58	0.50
2	25	0.34	0.34	0.45	0.37	0.30	0.00	1.07	0.25
4	25	0.63	0.61	0.73	0.61	0.44	0.08	1.47	0.42
6	25	0.86	0.86	0.99	0.80	0.56	0.08	1.85	0.59
2	50	0.49	0.48	0.56	0.51	0.40	0.07	1.52	0.33
4	50	0.73	0.72	0.83	0.72	0.52	0.07	1.83	0.50
6	50	0.96	0.96	1.09	0.92	0.63	0.07	2.05	0.65

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